BUREAU OF HYGIENE AND TROPICAL DISEASES.

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## DISEASES DUE TO PROTOZOAN PARASITES.

LIGNIÈRES (J.). Sur la vaccination des bovidés contre la piroplasmose, la babésiellose et l'anaplasmose. Comparaison des procédés employés en Argentine et en Algérie. [**Vaccination of Bovines against Piroplasmosis, Babesiellosis, Anaplasmosis.**]—*Bull. Soc. Path. Exot.* 1928. May 9. Vol. 21. No. 5. pp. 371–378.

In this paper the author compares the methods employed in the Argentine and Algeria.

He points out that in the Argentine the important point is that it is not a question of protecting ordinary animals, even though they be of excellent quality, but of immunizing extremely valuable pure-bred imported animals. It would be a mistake, he says, to use the methods which are successful with Algerian bovines, or even animals imported into Algeria, for the Shorthorns, Herefords, and Polled Angus animals of the Argentine. The French investigators in Algeria do not suggest that the methods of immunization described by them are applicable to all other countries. No reference is made to Theileria infections, as Lignières has not encountered them in the Argentine.

According to the French authorities, it is unsafe to use blood from an animal which has recovered from an attack less than three months previously, and twenty months after recovery the blood may not immunize. This method cannot be used in the Argentine, for 5 or 10 cc. of blood from an animal recovered 20 or more months previously causes a high mortality in pure-bred animals. In the Argentine a strain of Babesia which is of low virulence is used, and trypanblue is used to check any reactions which appear to be dangerous. The weakly virulent strain is kept running in calves. When this method is carried out properly, the losses are practically nil.

In the case of Babesiella the facts are similar. In Algeria blood from an animal which has recovered three or four months previously is used, but such a procedure in the Argentine would lead to enormous losses. Lignières has seen the blood of an animal which had recovered from babesiellosis 26 months previously produce most acute and virulent infections in pure-bred cattle.

In immunizing against Babesiella Lignières first injects *B. bigeminum* which, while not conferring immunity against Babesiella,

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exalts the resistance of the animal, and then injects a selected strain of Babesiella, controlling severe reactions by quinine and antipyrine.

In Algeria immunization against anaplasma is achieved by inoculating blood taken from an animal 5 to 6 days after injection, long before any symptoms of anaplasmosis develop.

Experience in the Argentine has shown that this method is dangerous, and successful immunization against anaplasmosis has been achieved by passing the parasite through sheep or goats in series. At least six such passages are necessary to reduce the virulence of the parasite sufficiently to allow it to be used for the immunization of pure-bred cattle. Emphasis is laid on the point that while piroplasmosis and babesiellosis have a wide distribution in the Argentine, anaplasmosis is more restricted. Immunization with anaplasma passed through sheep, while giving a good immunity, obviates the risk of introducing a highly virulent strain into a district previously free.

LIGNIÈRES (J.). A propos des expériences comparatives faites en Algérie entre anaplasma argentin et anaplasma algérien. [**Comparative Tests with Argentine and Algerian Anaplasma.**]—*Bull. Soc. Path. Exot.* 1928. May 9. Vol. 21. No. 5. pp. 378–380.

The French investigators in Algeria have come to the conclusion that the strains of anaplasma from the Argentine and from Algeria are identical, but Lignières finds himself unable to agree completely with this view.

He points out that while in one experiment calves immunized against the Algerian strain were resistant to the Argentine strain, a calf immunized against the Argentine strain showed a slight increase in the parasites in its blood which lasted for 16 days when it was inoculated with the Algerian strain.

Lignières admits that a single experiment is insufficient to base any definite conclusion upon, but such as it was, the evidence was not in favour of complete identity of the parasites.

Analogous cases are not rare. Lignières points out that 25 years ago he showed that *Babesiella argentina* confers a good immunity against very virulent strains of *Piroplasma bigeminum*, but that the immunity conferred by the latter against the former is infinitely weaker.

There are, however, other factors which appear to Lignières to distinguish the two parasites. The results obtained by the French investigators showed that the goat is refractory to Algerian anaplasmosis and that while sheep could sometimes be infected, attempts to transmit it in series in sheep failed.

In the Argentine goats can invariably be infected, and it can be carried on in goats in every instance. Sheep also can be infected by intravenous infection and they continue to harbour the parasite for years.

Experiments carried out in Algeria with the Argentine strain support Lignières' contention. The Argentine strain sent to Algeria was derived from two sheep, one of the second passage and one of the third, brought by Lignières to Alfort.

Before definitely deciding whether the Algerian and Argentine strains of anaplasma are identical or not, it will be necessary to show that the differences are not due to the goats and sheep used in Algeria. It will also be necessary to test calves immunized against the Argentine strain with the Algerian anaplasma.

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SERGENT (Edm.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). Les piroplasmoses bovine d'Algérie. Deuxième mémoire. Méthodes de prémunition. [**The Bovine Piroplasmoses of Algeria. 2nd Memoir. "Premunization" Methods.**] —*Arch. Inst. Pasteur d'Algérie.* 1927. Sept. Vol. 5. No. 3. pp. 245–468. With 57 figs.

The whole of this number of the *Archives de l'Institut Pasteur d'Algérie* is taken up with an account of the authors' work in connexion with protective inoculation against the various intracorpuscular parasites of bovines occurring in Algeria, and as the memoir covers more than 200 pages a detailed abstract is out of the question.

The period covered by the report is 1924–1927. The report is divided into two main parts. The first of these contains accounts of further experimental work regarding the nature, evolution and treatment of each of the diseases, and of the experiments in connection with "premunization." The second part contains the results of immunizations carried out in the field during the four years under review.

Finally, the general conditions governing immunization against Algerian piroplasmoses are laid down.

Infections due to *P. bigeminum*, *Babesiella berbera*, *Anaplasma marginale*, *Theileria dispar*, and *Gonderia mutans* are described.

Of these the last only is not pathogenic.

The essential parts of these investigations have been published before and have been dealt with.

YAKIMOFF (W. L.), et al. Contribution à l'étude de l'immunisation vis-à-vis de la piroplasmose (babésiellose) des bovidés. [**Immunization against Babesiellosis in Bovines.**] Première partie. Essais d'immunisation expérimentale des animaux [YAKIMOFF, MARKOFF–PÉTRASCHEWSKY (E.N.), LOUKIANOFF (W.L.) & WOITZEKHOWSKY.] Deuxième partie. Immunisation par le trypanobleu (trypanobleunisation). [YAKIMOFF, MARKOFF-PÉTRASCHEWSKY, RASTEGAIEFF (E.F.) & GNIEDINE (A.N.).] Troisième partie. Immunisation d'après le procédé de Theiler (theilérisation). [YAKIMOFF, MARKOFF-PÉTRASCHEWSKY & RASTEGAIEFF.] —*Ann. Inst. Pasteur.* 1928. Mar. Vol. 42. No. 3. pp. 282–319.

Among the possible measures which may be utilized for the control of piroplasmosis immunization appears to be the most practical.

The authors deal briefly with the attempts which have been made to establish immunity by means of (1) blood from a recovered animal, (2) blood attenuated by storage in a cold chamber, (3) inoculation with crushed ticks, and (4) by means of what the authors call vaccination by trypanblue.

The authors detail a few cases in which immunization was effected by subcutaneous inoculation with virulent blood followed by treatment with trypanblue immediately the parasites appeared in the blood. They found that a solid immunity was established.

Three heifers were given an injection of 1 gramme of trypanblue and at intervals ranging from 21 days to 2 months they were inoculated with blood containing the parasite. Piroplasms appeared in the blood in all three cases.

The authors state that they propose to call methods of immunization in which the virus is attenuated by chemical means chimio-immunization. The method of injecting trypanblue only they term "trypano-

bleunisation." The injection of virus followed by trypanblue is called theilerisation, and immunization against a number of parasites simultaneously they term lignièresisation.

When put into practice in the field the simple injection of trypanblue did not appear to be very effective as a process of immunization. Yakimoff finds that immunization can be effected against *Babesiella bovis* by injecting the virus and following this with trypanblue (theilerisation). In a small number of cases the virus and drug were injected simultaneously. Most of the animals suffered from a mild attack and recovered.

VIEREY (F.). Traitement des piroplasmoses bovines. [**The Treatment of Bovine Piroplasmoses.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. July. Vol. 80. pp. 384–393.

Treatment to be effective must be given early; if delayed results are less satisfactory and, further, it is a point of economic importance that smaller quantities of the drugs are required when the disease is treated promptly. The author uses glucose, which is dissolved in an isotonic solution, and is obtainable in ampoules containing 125, 250, and 500 grammes (apparently of the solution).

In most cases the author finds that 3 ampoules of 250 grammes are sufficient. When treatment is delayed as many as 6 such ampoules may be required.

When treatment is begun early the contents of one ampoule is injected subcutaneously behind the elbow at intervals of 24 hours.

Intravenous injection has not been found to be superior to subcutaneous injection. More than a hundred cases have been treated in this manner, and it is claimed that recovery took place in 82 per cent. Of the failures 12 per cent. were attributable to delay in beginning treatment.

Brief details of a dozen cases are given. The treatment generally results in a rapid fall of temperature after the first dose of glucose. There may be a slight rise again, but this is rapidly checked by the second dose. In all cases in which treatment was begun early, but which nevertheless relapsed, evidence of serious involvement of the lungs was promptly forthcoming.

The author puts forward certain theories to explain the beneficial effects produced by the injections of glucose.

COLLIER (W. A.). Zur Therapie der Piroplasmose mit Bayer 1037 (Asuntol). [**The Treatment of Piroplasmosis with Bayer 1037 (Asuntol).**]—*Berlin. Tierärzt. Wochensch.* 1928. Apr. Vol. 44. No. 15. pp. 247–248.

The author records the results of a very small number of experiments carried out in the Argentine.

The drug was used as a 5 per cent. solution in water. One cow weighing about 660 lb. was given 8 g. intravenously and was inoculated intramuscularly at the same time with *P. bigeminum*. There was no evidence of infection. No controls were used either for the blood used for inoculation or to test the result of the inoculation of the animal treated.

One animal in which the disease had been produced by intramuscular inoculation was treated with the drug. 12 g. were given of which

half was injected intravenously and half subcutaneously. Immediately after the animal developed severe symptoms of piroplasmosis, but it eventually recovered.

GISH (A. H.). **Anaplasmosis in Cattle, or a Similar Disease.**—*Veterinary Med.* 1928. Mar. Vol. 23. No. 3. pp. 106–109.

The author describes a disease which he encountered in Kansas, which he believes to be anaplasmosis.

DUKE (H. Lyndhurst). **On the Effect on the Longevity of *G. palpalis* of Trypanosome Infections.**—*Ann. Trop. Med. & Parasit.* 1928. June 12. Vol. 22. No. 1. pp. 25–32.

The author has collected data available in his laboratory regarding the duration of life of laboratory-bred flies both infected and non-infected. "The data presented are very limited and their statistical value cannot be great."

It has been estimated that the probable average duration of life of *G. palpalis* in Uganda is 2 to 3 months, and under laboratory conditions flies frequently survive up to 50 days, so that it would seem that there is no great difference between the two. There is no evidence to suggest that the presence of cyclical stages of development in the flies causes either a reduction or prolongation of the period of life of the fly.

KLIGLER (I. J.). **Susceptibility and Resistance to Trypanosome Infections. IV.—The Duration, Specificity and Hereditary Transmission of Resistance acquired after Cure with "Bayer 205" (Germanin).**—*Ann. Trop. Med. & Parasit.* 1928. June 12. Vol. 22. No. 1. pp. 21–23.

It has been shown that animals cured of trypanosomiasis with "Bayer 205" develop a resistance to infection which lasts about 5 months, and that this resistance appears to be cellular, since no humoral antibodies can be detected, and blocking the endothelial cells with oil, or their destruction by means of benzol, causes a breakdown in immunity.

The present paper reports experiments bearing on the specific nature of this resistance and its intra-uterine transmissibility to offspring.

Details of the experiments are given and from these it is concluded that: (1) Guineapigs infected with *T. evansi* and cured with "Bayer 205" are as resistant to re-infection with *T. gambiense* as with the homologous trypanosome. The converse also holds good. (2) The resistance to re-infection is not transmitted to offspring born while the mother is in a state of solid resistance.

RICHARDSON (U. F.). **Notes on Trypanosomiasis of Cattle in Uganda.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Aug. 22. Vol. 22. No. 2. pp. 137–146.

In the early days of veterinary work in Uganda it was assumed that most of the varieties of trypanosomes found in cattle were pathogenic and caused a fatal infection.

It was early suspected that *T. brucei* was not frequently responsible for fatal disease in cattle, and that *T. congolense* was not markedly pathogenic for horses and donkeys. The restocking of Sesse in 1922 confirmed the non-fatal nature of *T. brucei* infections, and threw doubts on the pathogenic powers of *T. vivax*. Later, doubt began to arise whether *T. congolense* was invariably fatal to cattle, and it is becoming more and more apparent that animal trypanosomiases cannot be regarded as a single disease—nagana. It is probable that each trypanosome differs from others in its pathogenicity, reaction to drugs, and natural manner of transmission. The author has had a batch of experimental animals under observation for a period of about five years, and in this paper he records the results of his observations.

*T. theileri.*—This trypanosome has rarely come under observation save in animals in the process of immunization against rinderpest. The inoculation appears to produce a relapse of trypanosomiasis, and the combination may cause a fatal termination.

*T. brucei* is rarely encountered in cattle save in *G. palpalis* areas, and the evidence available indicates that it is not pathogenic to the cattle of the country.

*T. vivax* has been detected in 24 animals at the laboratory and in a considerable number in the field. At the laboratory no death could be ascribed to it.

In the field mortality varies in different outbreaks. Highly virulent strains or environment and conditions may have been responsible, and the possibility of virulent strains occurring cannot be ignored. The evidence collected in Uganda suggests rather that the latter are the more important determining factors in fatal outbreaks.

*T. vivax* and *T. brucei.*—Animals exposed to *G. palpalis* on the Sesse Islands became infected with *T. brucei* and *T. vivax* within a few months, but the loss did not exceed 10 per cent. In grade animals the loss was higher, but other factors, such as tick-borne diseases, had to be taken into consideration.

The experience gained on the Sesse Islands indicates that the loss of 10 per cent. at first is mainly due to *T. vivax* and *T. brucei* complicated by changes of conditions and grazing. The animals remain poor for about a year and then make a complete recovery.

*T. congolense.*—Strains of this trypanosome obtained in the field proved virulent for cattle for two passages and then apparently became practically avirulent.

In field experience where the absence of tsetse was assured it has been noted that usually most of the adult cattle die. Cases with a different history have been noted. In one instance in a natural outbreak only 12 out of 79 became affected and of these only seven died. The disease then disappeared without any measures of segregation.

It seems not improbable that such outbreaks are not reported, and that they are more common than is supposed.

It is suggested that these outbreaks are due to a strain which has been passed mechanically through a number of generations and has lost not only virulence but eventually power to infect.

It appears that strains of a trypanosome may vary in virulence, but upon what this variation depends is not known. The author is of the opinion that *T. brucei* and *T. theileri* are non-pathogenic for Uganda cattle unless they are associated with other diseases, and, further, that *T. vivax* is far less virulent than has been thought.

Serious results in cases of *vivax* infections are largely due to contributory causes.

The variations in the virulence of *T. congolense*, which is usually very pathogenic, are considerable. Certain strains appear to be avirulent, but it is uncertain whether such strains can be produced at will, and whether such avirulence can be maintained in all subsequent passages.

Animals may be infected with *T. brucei*, *T. vivax* or *T. congolense* (avirulent strains) and show only an occasional trypanosome in their blood, even when daily examination of moist films is carried out for periods of a year or even two. That these occasional appearances do not represent re-infections in animals possessing some immunity is indicated by the fact that when re-infection, experimentally produced, occurs the blood swarms with the parasites.

In seven attempts to re-infect animals which have apparently recovered from *T. congolense* infections success has been achieved once only, and then in an animal previously treated with tartar emetic. On the other hand, in seven attempts to re-infect with *T. vivax* there has been only one failure. In successful experiments the blood swarms with the parasite for about three days from the tenth day after inoculation. Exposure to *G. morsitans* or *G. pallidipes* will usually cause an outbreak of *congolense* infection, while exposure to *G. palpalis* will cause one due to *T. vivax*. The field evidence suggests that *G. palpalis* does not ordinarily transmit *T. congolense*.

Two experiments indicate that *T. congolense* can be transmitted naturally in the absence of tsetse flies. In each case the period of contact between infected and non-infected animals in a tsetse-free place was seventeen to nineteen days before infection occurred.

It has been noted repeatedly that when an outbreak of trypanosomiasis occurs in the absence of tsetse flies animals under two years of age escape infection.

It is not known what fly acts as the mechanical carrier of the infection. Experiments with wild stomoxys have all yielded negative results. In Uganda outbreaks occur in which, so far as can be ascertained, no tsetse fly is involved and no introduction of possibly infected stock has taken place. The tendency is to explain these outbreaks on the idea that the immunity of a "premunized" animal has broken down and that spread by mechanical transmission has followed.

A reliable test for the detection of "premunized" animals is urgently needed. The formol-gel test gave some positive results with *vivax* infections, but with *congolense* infections the results were negative.

The most satisfactory treatment for *T. congolense* infections is the administration of 1 gramme of tartar emetic intravenously on four consecutive days. This will not effect a cure in every case, but it has a high factor of efficiency.

In a laboratory experiment it was found that the administration of the drug during the period of incubation was without effect. No drug has been found as yet which will effect a cure in the case of *vivax* infections.

BEVAN (Ll. E. W.). **A Method of Inoculating Cattle against Trypanosomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Aug. 22. Vol. 22. No. 2. pp. 147–156.

Bevan gives a brief survey of his experiments in the treatment of trypanosomiasis in cattle which have been carried on during the last

twenty years, and he acknowledges that the good results which have been achieved with potassium antimonyl tartrate in Southern Rhodesia must be attributed more to luck than judgment, as for a long time information was lacking as to the manner in which the drug acted, nor was anything known regarding the correct dose, and time or manner of administration.

For many years 1 g. of the drug dissolved in 100 cc. of boiled water has been the amount used, and this has been injected intravenously. In Southern Rhodesia the ill-effects recorded by HORNBY have not been noticed. They may have occurred, but they have not been of practical importance. The objections to this method are that the dose is very large, the escape of any of the solution into the subcutaneous tissue leads to abscess formation, and the time and labour necessary for the operation.

It appears to be a fact that while some investigators have attempted to obtain complete sterilization of the animal as regards trypanosomes by drug treatment, such complete sterilization is never achieved, and it appears to be unnecessary, for practical purposes, to obtain complete sterilization. The results obtained in piroplasmosis by means of trypanblue suggested that the potassium antimonyl tartrate might act in a similar manner in trypanosomiasis, that is to say, by killing off the organisms, liberating toxins, and stimulating the formation of antibodies and thus keeping the trypanosomes remaining in check. That the drug does not effect a change in the trypanosomes themselves is indicated by the fact that the disease produced experimentally with trypanosomes derived from a successfully treated animal behave in the normal way. The recovery is then due to the resistance developed by the animal. A further point is that recovered animals are very resistant to re-infection.

Field tests showed that it was not necessary to put animals through a long course of treatment, for success was often obtained when only one, two, or three injections were given. In the course of a considerable number of years Bevan has inoculated imported animals against the tick-borne infections. The method used is the injection of " standardized " strains of the parasites passed through native calves until attenuated strains were arrived at. These, when used for the inoculation of imported animals, produced mild attacks from which they recovered. Excessive reactions to piroplasmosis infections were controlled by trypanblue injections.

It was decided to attempt to devise a method of inoculating against trypanosomiasis on the same lines. It was thought that if cattle could be inoculated with a known virus, and treated appropriately before being exposed in fly areas, the necessity for treating animals every month in the hope of catching newly infected animals would be done away with.

Experience has shown that in treating trypanosomiasis success depends to some extent on careful " timing." A number of strains of *T. congolense* were studied and it was found that the period of incubation was about ten days, with trypanosomes numerous in the peripheral blood by the 14th day. These disappeared on the injection of 1 gramme of potassium antimony tartrate in 50 cc. of sterile water, and remained absent for seven to eleven days. In all cases they had reappeared by the 14th day after the injection. A second injection on that day resulted in their disappearance again, but as a rule thay had reappeared

14 days later. A third injection given a month after the second caused their disappearance again, and they only reappeared in very small numbers. On the first appearance of parasites the temperature rose, the animals were dull, with hanging head, drooping ears, lachrymation and a staring coat. This condition persisted until about a fortnight after the second injection. From this time onwards improvement set in and the lost condition was rapidly regained. To test the resistance to re-infection a highly virulent strain was produced by passage through rats. The duration of the disease was reduced by this means from 21 to 9 days. The resistance of the protected animals did not break down when they were inoculated with large doses of this strain, or with blood from cattle dying of infection in fly areas where the inoculation strain originated. Bevan proposes to carry out a large scale experiment by subjecting protected animals to natural infection.

One failure demonstrated a point of practical importance. A number of treated animals were sent into a belt to become infected naturally. All died of piroplasmosis. The fact was overlooked that the area where these animals were born and reared had been freed from ticks by systematic dipping, and the animals were susceptible to tick infection.

This drew attention to the danger of transmitting other diseases, and it was overcome by using sheep as virus carriers.

It is not claimed that the system is perfect, but it has yielded good results in practice in Rhodesia, and it is suggested that parallel tests may be made elsewhere.

CORSON (J. F.). **A Note on Some Inoculations of Animals from Cases of Sleeping Sickness** (*Trypanosoma rhodesiense*) **in the Ikoma District of Tanganyika Territory.**—*Jl. Trop. Med. & Hyg.* 1928. Sept. 1. Vol. 31. No. 17. pp. 214–216.

Little is known regarding the incidence of polymorphic trypanosome infections of domestic animals in the Ikoma District. Six local sheep of the sleeping-sickness area inoculated with blood from five untreated cases of sleeping sickness all died. The average period of survival was about two months. Rats were infected from the sheep and lived about 40 days. Three sheep and three goats of a fly-free area were inoculated with three strains of *T. rhodesiense* conveyed in white rats from the sleeping-sickness area. Two pairs died, but the third strain failed to infect either animals.

The author confirms the findings of KLEINE and WENYON and HANSCHELL regarding variations in morphology of different strains, and variations in the proportions of posterior nuclear forms at different times. No posterior forms were seen in the long slender trypanosomes.

In the course of a number of experimental inoculations it was observed that virulence for experimental animals was not necessarily associated with polymorphism or with the presence of numerous posterior-nuclear forms, but posterior-nuclear forms appeared to be more common in guineapigs than in white rats.

The results of experiments with blood from relapsed cases after treatment were inconclusive.

KNOWLES (R. H.). **Trypanosomiasis of Camels in the Anglo-Egyptian Sudan: Diagnosis, Chemo-Therapy, Immunity.**—*Jl. Comp. Path. & Therap.* 1927. June. Vol. 40. No. 2. pp. 118–143. With 1 text fig.

Knowles describes experiments with naganol either alone or in conjunction with potassium antimony tartrate or the sodium salt. Naganol was given in 10 per cent. solution in water intravenously by gravitation. The antimony salts were given in 2 per cent. solution by the same route.

Naganol is non-irritant, so that it is immaterial if a little passes into the connective tissue, and it is not necessary to inject saline solution.

The experiments were controlled by microscopic examination of the blood over long periods, by animal inoculation, and by the formol-gel test.

In the doses used naganol is quite non-toxic even when the circulation is swarming with trypanosomes.

From the results obtained in a considerable number of cases treated the author concludes that naganol is a specific for the treatment of trypanosomiasis in camels, and that the intravenous injection of 10 grammes in 10 per cent. solution brings about the destruction of all the trypanosomes in the body.

In view of the efficacy of the formol-gel test and of the satisfactory results obtained with naganol it was determined to attempt to eradicate trypanosomiasis from a group of animals.

The animals selected belonged to the camel company of the Eastern Arab Corps at Kassala. The formol-gel test showed that of 196 animals 74 were positive.

Seventeen of the 74 were found infected by a single microscopic examination. Twelve of these were selected for treatment with naganol and tartar emetic and 60 of the remainder were treated with naganol alone. Of the latter batch 56 improved greatly in condition and were negative to the formol-gel test. The remaining four died of other diseases.

Of the 12 treated with the combined drugs 11 made good recoveries and the remaining one, although apparently cured of trypanosomiasis, died of another infection. Prior to this experiment there had been an annual slaughter of about a dozen camels for advanced trypanosomiasis every rainy season. After the treatment no animals were slaughtered and no cases were detected. A considerable number of animals have been treated on the results of clinical examination alone, and there has been great improvement in condition, although the animals were at work.

Figures are also given of the results of treatment in a smaller camel unit. They are equally satisfactory.

The object in testing naganol in combination with tartar emetic was to try to reduce the cost of treatment by reducing the amounts of naganol necessary.

The author confirms the appearance of symptoms of intoxication if tartar emetic be injected when trypanosomes are numerous in the blood. In using this drug therefore either there must be a delay before it is injected or naganol must be given the day before to clear the circulation.

Experiments with this form of treatment are as yet not very numerous but the results are good. Thirteen animals have been treated

and all have become negative to the formol-gel test, have returned to good working condition and have remained so for nine months.

A small number of experiments with full controls have been carried out to test whether animals cured with naganol acquire any immunity to re-infection, and the results indicate that this is the case. A similar result does not appear to be obtained when cures are effected by means of tartar emetic.

DAUZATS (H.). Essais de traitement des trypanosomiases des équidés dans le Nord-Caméroun. [**Attempts to treat Equine Trypanosomiasis in the North Cameroons.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. Aug. Vol. 80. pp. 431–439.

The author found that the intravenous injection of aniline emetic in 2 per cent. solution is liable to give rise to alarming symptoms of incoordination and collapse.

The strength of the solution used was reduced to 1 per cent., and it has been used in conjunction with atoxyl.

The author claims 15 recoveries out of 17 animals treated. Both drugs were given intravenously and alternately with varying intervals. From the details of three cases given it appears that the period required to effect a cure varies from a few weeks to several months.

As the result of his experiments the author proposes the following scheme of treatment.

As aniline emetic is depressant treatment is begun with atoxyl. This drug is not only trypanocidal but has a stimulating effect upon the defensive powers of the body. To prevent any cumulative action atoxyl is given at 10-day intervals, and doses of 0·6 to 1·5 g. of aniline emetic in 1 per cent. solution are given in the intervals. If such doses are well tolerated larger quantities are given up to 2·2 g.

The author was not in a position to determine what trypanosomes were present in the horses treated.

Treated animals were able to return to work, but it is not certain that definite cures were obtained, as sudden attacks of weakness or fatigue were observed in some of them.

The author suggests that, as a result of his own rather limited experience, one injection of 5 grammes of atoxyl before entering a fly area and a repetition of the injection every 10 days affords effective protection against infection.

AKAZAWA (S.), SADATAKA (I.) & KATUYA (K.). **The Vacillation of the Wassermann and Sachs-Georgi Reaction in the Experimental Trypanosomiasis of Animals.**—*Jl. Jap. Soc. Vet. Sci.* 1928. Jan. Vol. 7. No. 1. pp. 83–85. [Authors' English Abstract.]

The trypanosome used in the experiment was that isolated from the Formosan water buffalo, and was probably *T. evansi*. Cattle, horses and rabbits were used in the tests.

Of 8 Korean calves all showed a strikingly positive reaction to the Wassermann and Sachs-Georgi tests. "The vacillation of reaction was noted in all cases and ran almost parallel in both tests."

The Wassermann reaction in cattle generally appears about 10 weeks after inoculation. The capacity to react varies from time to time.

The Sachs-Georgi reaction can be obtained within a week of infection, and it can be obtained for a longer period than the Wassermann

reaction. Variations in the degree of reaction are observed, but they are not so pronounced as in the case of the Wassermann test.

The variations in the reactions do not appear to be connected either with the severity of the symptoms or with the presence of trypanosomes in the blood.

GALLIARD (H.). Guérison spontanée de l'infection mixte à *Trypanosoma brucei* et *Treponema crocidurae* chez la souris blanche. [**Spontaneous Recovery from a Mixed Infection with** *T. brucei* **and** *Treponema crocidurae* **in the White Mouse.**]—*Bull. Soc. Path. Exot.* 1928. Apr. 18. Vol. 21. No. 4. pp. 315–316.

The author has carried out experiments with *Trypanosoma brucei* and *Treponema duttoni*, *T. crocidurae* and *T. hispanicum*.

With *T. duttoni* and *T. hispanicum* mixed infections of comparatively short duration have been obtained, but with *T. crocidurae* survival is much longer, and in two cases complete recovery has taken place.

The course of the disease was practically the same in the two cases. The spirochaetes appeared in the blood on the second day and persisted in varying numbers until the 14th day. Trypanosomes were discoverable for three days and then completely disappeared. The blood of one of the mice was used for inoculation of a number of rats. All failed to become infected. The two original mice were still alive 134 and 147 days after inoculation.

In a third case the mouse died in a cachectic condition on the 88th day without showing any parasites in its blood.

HOARE (C. A.). **Studies on** *Trypanosoma grayi* : **the Effect of Goat's Blood.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Aug. 22. Vol. 22. No. 2. pp. 131–136.

The experiments described in this paper were carried out for the purpose of checking a statement made by MINCHIN and his collaborators to the effect that *T. grayi* was acted upon unfavourably by goat serum. Hoare is not able to find any evidence that this is the case.

MAROTEL. Recherches thérapeutiques sur deux maladies parasitaires : la coccidiose et la trichostrongylinose. [**Experiments in the Treatment of Coccidiosis and Trichostrongylosis.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. Apr. Vol. 80. pp. 204–207.

The author claims as the result of experiments carried out with eight bovine animals affected with trichostrongylosis, and six bovines and five rabbits affected with coccidiosis, to be in a position to advise systems of treatment which, if followed carefully, will effect cures in both categories of diseases.

Bovine coccidiosis.—1. Remove all bovines healthy and diseased from the pasture where the infection is being picked up, and utilize the grazing for horses and sheep.

2. Infected animals are to be housed, while the healthy are to be placed on dry ground, as there will be no risk of infection since moisture is necessary for sporulation of the coccidia.

A mixture of 10 to 15 grammes each of thymol and tannoform is given to each animal daily for 5 days. It is advised that the powdered drugs be sandwiched between slices of beetroot or mangold. Animals are said to eat this greedily.

Also each animal is to be given morning and evening for 5 days a rectal infection of 2 litres of 1 per cent. sulphate of copper solution.

Re-infection is prevented by careful collection and burial of faeces, and disinfection of the standings with boiling water twice a week.

All green food and stagnant water must be strictly avoided.

For parasitic gastro-enteritis of bovines the treatment advised is as follows :—

1. Remove the animals from infested pasture.
2. Diseased animals are to be isolated and their faeces destroyed. The faeces of apparently healthy animals are to be similarly dealt with as they are certain to contain eggs.
3. 300–500 cc. of 1 per cent. sulphate of copper is to be given before food in the morning "every 5 days for 15 days" and no purgative. For the sheep the dose is 50 to 100 cc.

The faeces are to be destroyed.

The author gives no details regarding the methods by which he was able to assure himself that the treatments he advises are really effective. He only states that his diagnoses were based upon microscopic examinations. He states that trichostrongylosis in bovines is caused by *Haemonchus contortus, Hematodirus filicollis, Trichostrongylus instabilis,* Cooperia, and Ostertagia. He recognizes that some of these are readily detectable with the naked eye and others are not, but he gives no indications of the steps he took to ascertain which species were present in the small batch of animals which he had for treatment.

ARAGÃO (H. de B.). **Tegumentary Leishmaniosis and its Transmission by Phlebotomi.**—*Mem. Inst. Oswaldo Cruz.* 1927. Vol. 20. No. 2. pp. 187–195. With 1 plate.

Observations and experiments carried out at Rio de Janeiro in 1921 and the following years indicate that Phlebotomus flies, and particularly in this outbreak *P. intermedius* Leitz and Neiva, act as the transmitting agents.

## DISEASES DUE TO METAZOAN PARASITES.

DAVIS (L. J.). **Note on a Filarial Embryo in the Blood of a Sudanese Ox.**—*Ann. Trop. Med. & Parasit.* 1928. June 12. Vol. 22. No. 1. pp. 59–61.

The embryo was found in the blood of a bull which was suspected of trypanosomiasis. The animal had been brought from the Nuba Mountains Province.

In moist films the parasite showed active movement which did not result in much translation. In live films the embryos measured 300$\mu$ by 7·5$\mu$ and in fixed films 240$\mu$ by 4·5$\mu$.

Throughout the greater part of the length nuclei are closely packed, but at the anterior end there is an area devoid of nuclei. There is a break in the column of nuclei at about $\frac{1}{5}$ its length from the anterior end, and a second less pronounced one at about $\frac{1}{3}$ the length from the anterior end. From the mid-point backwards for some distance is a clear area which contains only a few nuclei.

In many specimens a loose sheath with delicate transverse striations could be seen.

The microfilaria shows a distinct nocturnal periodicity, parasites being about 12 times as numerous at midnight as at midday. A blood count showed :—

| | | | |
|---|---|---|---|
| Polymorphonuclears | ... | 16·6 per cent. | |
| Lymphocytes | ... ... | 76·6 | ,, ,, |
| Eosinophiles ... | ... ... | 6·8 | ,, ,, |

YANO (A.). **Findings in the Kidney of the Dog infested with** *Filaria immitis*, **and Experimental Studies on the Toxic Substance of** *Filaria immitis*, **Microfilaria and the Egg. Parts I to III.**—*Japan Med. World.* 1927. Sept. 15, Oct. 15 & Nov. 15. Vol. 7. Nos. 9, 10 & 11. pp. 263–266 ; 292–296 ; 324–327.

The author brings evidence to show that the changes in the kidney are due to the action of a toxin, and are not produced mechanically.

ERSCHOW (W. S.). Drei Thelaziaarten aus der Conjunctiva des Rindes in der U.S.S.R. [**Three Species of Thelazia in the Conjunctiva of Cattle in Russia.**]—*Deut. Tierärzt. Wochensch.* 1928. Aug. 18. Vol. 36. No. 33. pp. 553–556. With 9 text figs.

The author gives a detailed description of *Thelazia rhodesi* (Desmarest 1827), *Thelazia gulosa* Railliet and Henry 1910, and *Thelazia skrjabini* Erschow, 1928. Figures of the salient features are given.

TROISIER (J.), DESCHIENS (R.), LIMOUSIN (H.) & DELORME (M.). L'infestation du chimpanzé par un nématode du genre *Hépaticola*. [**Infestation of a Chimpanzee by a Nematode of the Genus** *Hepaticola.*]—*Ann. Inst. Pasteur.* 1928. July. Vol. 42. No. 7. pp. 827–840. With 2 text figs., and 1 coloured plate.

The authors have encountered two cases in which the eggs of a parasite belonging to the genus *Hepaticola* have been detected in the liver of chimpanzees.

The eggs measured on an average 51·5 by 29$\mu$. They were double contoured and showed an orifice at each end. The outer layer of the shell was 4$\mu$ thick, brownish in colour and radially striated. The inner layer was about 2$\mu$ thick at the equator of the eggs and thinner towards the poles.

In the first case very few eggs were discoverable, and these were surrounded by a more or less dense fibrous capsule, external to which there were a few lymphocytes and plasmocytes. Apart from this lesion the liver appeared to be perfectly healthy.

In the second case the lesions were far more diffuse, and it appeared to be clear that they varied in age, as in some the eggs were quite fresh and in others marked degeneration had occurred, and they were surrounded by cicatricial tissue. The adult parasite was not found.

MIYAMOTO (T.). *Strongyloidosis intestinalis* **of Farrow in Formosa.**—*Jl. Jap. Soc. Vet. Sci.* 1928. Jan. Vol. 7. No. 1. pp. 43–52.

White diarrhoea is a common disease of young pigs in Formosa, which is one of the principal pig-rearing countries of Japan, and it is

generally considered that parasites of the genus Strongyloides are the cause of the condition.

Two species of Strongyloides have been detected, viz., the parasitic generation of *S. suis*, and that of *S. westeri*.

The author states that the effects of infestation may be directly due to the parasites or to secondary infections.

JOYEUX (Ch.). Recherches sur la faune helminthologique algérienne (cestodes et trématodes.) [**The Cestodes and Trematodes found in Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1927. Dec. Vol. 5. No. 4. pp. 509–528. With 1 text fig.

This paper is a continuation of one published in 1923 in the *Archives de l'Institut Pasteur de Tunis*.

The author gives an account of the adult and larval cestodes and describes *Oochoristica erinacei* Meggitt 1920, n. var. *rodentium*.

A table gives parasites and hosts.

The cestodes of poultry are dealt with and finally the larval forms of trematodes found.

## BACTERIAL DISEASES.

RUPPERT (F.). Beitrag zur Diagnostik des Milzbrandes. [**The Diagnosis of Anthrax.**]—*Berlin. Tierärzt. Wochenschr.* 1928. Apr. 13. Vol. 44. No. 15. pp. 245–247.

The author points out that the diagnosis of anthrax is not a simple matter in every case. Examination of a film prepared properly is sufficient in a very large proportion of cases, but he has encountered instances in which the results obtained by microscopic examination, artificial culture, animal inoculation, and precipitin tests are not in agreement. In some cases microscopic examination has been definitely positive while culture and experimental inoculation have not afforded confirmation. Cultivation has failed in about 25 per cent. of cases in which the presence of anthrax was proved by other methods. Experimental inoculation yields far more accurate results than artificial cultivation.

CERNAIANU (C.). Die Pathogenese des Milzbrands und die Milzbrandschutzimpfungen in Lichte der neuesten Forschungen, sowie die Erfahrungen mit Kutivakzination in Bessarabian. [**The Pathogenesis of Anthrax and the Protective Inoculation against the Disease. The Results of Cuti-Vaccination in Bessarabia.**]—*Berlin. Tierärzt. Wochensch.* 1928. July 13. Vol. 44. No. 28. pp. 465–469.

The author considers that infection can take place only in the skin, and therefore immunity can only be produced by establishing a skin immunity.

He finds the cuti-vaccination superior to the subcutaneous injection method.

VELU (H.) & VAYSSE. Durée de l'immunité consécutive à la vaccination intradermique en un temps contre le charbon bactéridien. [**The Duration of the Immunity against Anthrax produced by a Single Intradermal Vaccination.**]—*Bull. Soc. Path. Exot.* 1928. Apr. 18. Vol. 21. No. 4. pp. 294–295.

Investigators who have carried out experiments regarding the production of immunity against anthrax by intradermal inoculation have been inclined to lay stress upon the solidity of the immunity produced rather than upon the duration of that immunity. The latter point is of the utmost importance to the clinician.

The authors report a case in which fourteen pure-bred and cross-bred animals were vaccinated by the single intradermal method in March, 1927. In February, 1928, 20 Moroccan cows were brought for service by the pure-bred bull, and three weeks later two of these died of anthrax. All the animals were vaccinated at once, including those which had been done a year before, and it would have been an interesting test of the immunity if those previously done had not been re-vaccinated, but their value made it impossible to take the risk. No case of anthrax occurred among those originally vaccinated.

The authors conclude that this shows that the immunity lasted a year.

MÉLANIDI (C.) & MYLIANOPOULO (M.). Accidents anaphylactiques sur des vaches à la suite de l'injection du sérum anticharbonneux. [**Anaphylactic Accidents in Cows injected with Anti-Anthrax Serum.**]—*Rev. Gén. Méd. Vét.* 1928. June 15th. Vol. 37. No. 438. pp. 312–314.

In November, 1925, three cows out of a herd of 25 died of anthrax at premises standing next to a tannery in the neighbourhood of Athens. The remaining animals were given anti-anthrax serum (of equine origin) and were afterwards inoculated with Pasteur vaccine. Each animal had 25 to 30 cc. of serum without any ill-effect of any kind.

Six months later two of the cows which had been vaccinated died of anthrax. Serum injections were again given and a triple anthrax vaccination was carried out using a double dose of the second vaccine for the third injection.

While the majority of the animals showed no disturbance, three cows and a bull showed signs of anaphylactic shock fifteen to twenty minutes after the injection of the serum. The symptoms included restlessness and kicking, gnawing with their teeth, and scratching with their feet on account of the pruritus. There was intense congestion of the skin and mucous membranes, and the lips of the vulva became markedly oedematous. Salivation and lachrymation were severe. Evacuation was frequent and the faeces became fluid after a time. Two cows showed urticaria and one had marked dyspnoea. The train of symptoms reached their maximum about a quarter of an hour after their onset, and they gradually decreased until at the end of an hour they had completely disappeared. The only sequel was some loss of appetite and reduction in the milk secretion during the next 24 hours.

Three months later the owner requested that his animals should be re-vaccinated as a precaution. As new animals had been bought and anthrax was known to be endemic in the district, injections of serum were again given prior to vaccination.

To reduce the risk of shock to each animal it was intended to give 2 cc. of serum and the remainder of the dose three-quarters of an hour later. But within 10 to 30 minutes, and while the last of the batch of animals were being injected, the whole of the animals, including those which had developed symptoms on the previous occasion, showed the symptoms described above.

It is especially noted that, although several of the cows were pregnant, not one aborted. The author suggests that a homologous anti-anthrax serum should be used.

DUNKIN (G. W.). **A Diagnostic Agent for the Detection of Johne's Disease and its Method of Preparation.**—*Jl. Comp. Path. & Therap.* 1928. June. Vol. 41. No. 2. pp. 94–108.

Those interested must consult the original of this paper for the preparation of this agent.

The technique of applying the test is the same as that for applying the intradermal tuberculin test.

BASSET (J.). Vibrion septique et *B. chauvaei* chez le cheval. [**Vibrion septique and *B. chauvaei* in the Horse.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. Feb. Vol. 80. pp. 65–75.

The author describes the effects of inoculating horses with the two organisms.

He finds that by intramuscular inoculation the results run parallel with those produced in guineapigs. Cultures of the vibrion are about fifty times as pathogenic as those of *B. chauvaei*.

BATES (L. B.). **Blackleg on the Canal Zone.**—*Proc. Med. Assoc. Isthmian Canal Zone.* 1921–1926. Vol. 14. pp. 9–13.

The author explains that the Board of Health Laboratory has always done a certain amount of animal pathology and bacteriology for two reasons: The veterinary services have no general laboratory and the personnel and equipment of the Board of Health Laboratory can readily be applied to the study of animal disease. Secondly, it is quite essential from the public health standpoint that the Health Department have first-hand information of disease occurring in the animal population for the protection of human health.

The present paper is to record the occurrence of blackleg in the Canal Zone. Three cases have been detected.

HUDDLESON (F.) & ABELL (Elizabeth). **Rapid Macroscopic Agglutination for the Serum Diagnosis of Bang's Abortion Disease.**—*Jl. Infect. Dis.* 1928. Mar. Vol. 42. No. 3. pp. 242–247.

This paper describes a detailed technique for the preparation of a special antigen, and apparatus for carrying out the agglutination test for abortion, and it must be studied in the original by those interested.

HOLTUM (A. W.). **A Double Intradermal Test for the Diagnosis of Bovine Contagious Abortion.**—*Jl. Comp. Path. & Therap.* 1928. Mar. Vol. 41. No. 1. pp. 25–53. With 5 figs. & 5 charts; June. No. 2. pp. 79–93. [15 refs.]

The author prepares an antigen for intradermal injection as follows:—

Subcultures on agar slopes (pH 7·6–7·8) are incubated for 72 hours at 37° C. and then left in the dark at room temperature for 12 days. The growth is washed off in normal saline containing 0·5 per cent. carbolic so as to make a "thick suspension." The suspension is heated in a water bath at 65° C. for half an hour.

The suspension is then standardized to correspond with Brown's standard opacity tube No. 10. Gates' method gave a reading of 6 mm.

The technique of the test is as follows:—

An area of skin on the side of the neck is shaved and wiped with alcohol. 0·2 cc. of antigen is injected intradermally. In some instances this suffices to produce a reaction, which is a diffuse warm painful swelling. The skin is measured before and during the test with ball-pointed calipers having an arc graduated in millimetres.

A thickening of the skin to twice its original measurement is considered positive.

Where there is no thickening a second dose is injected at the same place, and the first dose is looked upon as a sensitizing dose. Sometimes the injection produces a small amount of necrosis of the skin. This, however, resolves itself. The bulk of the paper is made up of detailed accounts of tests carried out, and the author compares his results with those yielded by the agglutination test, greatly to the favour of the intradermal test.

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## DISEASES DUE TO FILTERABLE VIRUSES.

OLITSKY (P. K.), TRAUM (J.) & SCHOENING (H. W.). **Report of the Foot-and-Mouth Disease Commission of the United States Department of Agriculture.**—*United States Dept. Agric. Technical Bull.* No. 76. 1928. June. 172 pp. With 4 text figs.

This report does not lend itself to brief abstraction as it runs to some hundred and seventy pages, and a list of its contents would convey little or nothing.

It may be noted that the outbreak which occurred in the United States in 1908 was traced to small-pox vaccine imported from Japan. Animals inoculated with this vaccine generally developed vaccinia only, but in some instances the lesions of foot-and-mouth disease developed. In another outbreak the infection was spread through the medium of infected hog cholera serum. This was obtained from pigs which showed no evidence whatever of infection at the time the blood was collected. In this case proof of the infectivity of the serum was not obtained until over sixty animals in all had been inoculated.

The work of the members of the Commission was carried out in European laboratories, and mainly at Strasburg.

In connexion with the question of the virus persisting in recovered animals, that is to say, the "carrier" problem, the authors failed to obtain any evidence of the existence of such carriers.

Attention is drawn to the vesicular stomatitis of horses and cattle in connexion with differential diagnosis and the disease is dealt with at some length in the report. At the onset of a disease characterized by vesicle formation resort should be had to experimental inoculation for the purpose of establishing a definite diagnosis of either foot-and-mouth disease or vesicular stomatitis. Guineapigs are not suitable, as they can be infected with both viruses. Cattle should be used, and they should be inoculated by scarification of the gums and also intramuscularly. If the disease is vesicular stomatitis the intramuscular inoculation will, in the authors' experience, fail to cause infection. Inoculation of horses should be carried out at the same time, as they are very resistant to infection with foot-and-mouth disease.

The occurrence of at least two types of virus is confirmed, as is also the fact that each protects only against its homologous type.

After infection solid immunity appears to last for about 3 months, but after about 7 months local resistance is lost, and after 18 months practically all immunity has disappeared.

There is no method known at present of producing immunity without causing actual infection.

Hyperimmune serum and " convalescent " serum in the few tests carried out appeared to be of about the same value prophylactically. The immunity conferred is, like all passive immunities, of brief duration lasting for one to two weeks.

The authors summarize the methods of control which are in force in the various countries in Europe visited by them.

With regard to the filtration of the virus the authors found that the charge carried by the virus is positive, and cataphoresis tests have shown that its isoelectric point is about pH=8.

By the use of standardized Bechhold collodion filters the authors have been able to calculate that the diameter of the virus particles lies between 20m$\mu$ and 100 m$\mu$.

There is no evidence to show that the virus is actually a fluid.

The American investigators found themselves in agreement with English research workers regarding the effects of various chemical substances upon the virus. The virus is not readily acted upon by agents which cause coagulation. It appears to be protected against them by the coagula owing either to its minute size or its positive electric charge.

The virus can be destroyed as readily as bacteria such as staphylococci by substances which do not cause coagulation such as antiformin or sodium hydroxide. It cannot therefore be stated definitely that resistance to chemicals is evidence of inanimate nature.

No success attended efforts to obtain artificial cultures of the virus.

The authors claim that under completely anaerobic conditions the viability of the virus is prolonged to at least twice the time obtained under aerobic conditions, and they state that the disagreement between their results in this respect with those of English investigators is probably due to difference in technique, it being held that while Böez apparatus permits of the production of complete permanent anaerobiosis, the English methods do not. For preservation of the virus the authors found the following factors to be favourable: A pH of 7·5 to 7·6 throughout the period of observation, strict anaerobic conditions, a temperature below 37° C., a semi-solid medium such as 0·25 per cent. agar or 10 per cent. gelatin, more particularly the latter. No satis-

factory results were obtained in experiments designed to test the respiration of the virus.

The general results obtained from experiments designed to test the survival of the virus outside the body under approximately normal conditions showed that it readily survives a month or more.

VALLÉE (H.), CARRÉ (H.) & RINJARD (P.). Sur la vaccination antiaphteuse. [**Vaccination against Foot-and-Mouth Disease.**]—*Rev. Gén. Méd. Vét.* 1928. May 15. Vol. 37. No. 437. pp. 257–259.

It has been shown that virus treated with formalin can be used for immunizing purposes, but the practical difficulty encountered in the application of this method is the provision of virus on a large scale for the preparation of the vaccine.

Since success has not as yet attended efforts to obtain the virus in artificial culture, resort must be had to culture *in vivo*.

It is well known that in guineapigs infected intradermally the blood is rich in virus between the twenty-fourth and the forty-eighth hour. The authors think therefore that at this stage not only the blood but the entire animal represents a valuable source of virus. They have therefore minced up an entire guineapig after removal of the skin, skeleton, stomach and intestines, gall-bladders and urinary bladder. From a 400 g. guineapig 80 grammes of mince were obtained.

To the mince normal saline was added so as to make a volume of 500 cc. Formalin was then added to the extent of 0·5 per cent. and after incubating at 20° C. for 48 hours an absolutely harmless antigen was obtained. They believe that the problem of vaccination against foot-and-mouth disease would be economically and practically solved if 50 cc. of such formalized vaccine were used for each bovine. This is the maximum dose that they have used in their experiments.

Seven animals ranging from 8 to 18 months old have been vaccinated subcutaneously, some with 50 cc. in one dose and others with 25 cc. doses at an interval of a fortnight. There was a fairly marked local reaction.

All the animals were tested together 50 days after the first injection along with one bovine control and sixteen large guineapigs. The test dose was a very severe one, representing 100,000 minimal infecting doses of a dilution of virulent lymph. The infection was by the intradermal path. None of the vaccinated animals showed any sign of infection.

It is suggested that smaller doses of vaccine may be effective.

Vaccine prepared in this way preserves its activity for at least forty-five days in cold storage. Experiments which are in the process of being carried out show that the sheep and the pig can be utilized in a similar way for the production of vaccine.

LECLAINCHE (E.). La stomatite vésiculeuse des bovidés. [**Vesicular Stomatitis of Cattle.**]—*Rev. Gén. Méd. Vét.* 1928. June 15. Vol. 37. No. 438. pp. 305–312.

A number of diseases characterized by the formation of lesions on various parts of the mucous membrane of the mouth have been described as occurring in cattle, but for the most part the descriptions are very vague.

Aphthous stomatitis, or, as it is termed in France, ulcerative stomatitis, occurs most frequently in lambs, other species being occasionally attacked.

Papular stomatitis has been given a number of names by different authors, and it is characteristic of this condition that vesicles are never formed. The lesions take the form of flattened papules ranging in size from a mustard seed to a lentil. Exfoliation takes place without vesicle-formation occurring.

These forms of stomatitis are fairly clearly defined, but most of the others that have been described are difficult to classify.

In 1925, COTTON, in the United States, described an outbreak of vesicular stomatitis among some young bovines. In no case did any of the animals show lesions on the feet, and, although the disease was suspiciously like foot-and-mouth disease, slaughter was postponed. Inoculation of six horses produced typical lesions and an elevation of temperature. The disease was therefore proved not to be foot-and-mouth disease.

COTTON has, however, placed it upon record that in vesicular stomatitis lesions involving the feet are not unknown.

In a country where foot-and-mouth disease is always present such cases would be unhesitatingly diagnosed as foot-and-mouth disease, but a doubt would arise regarding their nature in a country normally free.

The virus of stomatitis can be passed through bovines or equines in series without altering its virulence, and inoculated intradermally into guineapigs it produces lesions of the pads.

The blood of horses inoculated contains the virus during the first 24 hours, but it disappears after the formation of vesicles. This inoculability serves to distinguish the virus of vesicular stomatitis from that of foot-and-mouth disease, as the two conditions resemble one another very closely in other respects. That the two viruses are separate and distinct is indicated by the fact that there is no cross immunity. It is clear that the occurrence of vesicular stomatitis in a country ordinarily free from foot-and-mouth disease might cause serious loss if slaughter were resorted to.

The problem of what steps should be taken when an outbreak occurs and before definite diagnosis has been established is a difficult one, and one about which different views are held.

VALLÉE (H.) & CARRÉ (H.). Etudes sur la fièvre aphteuse. [**Foot-and-Mouth Disease.**]—*Ann. Inst. Pasteur.* 1928. Aug. Vol. 42. No. 8. pp. 841–869

This paper deals largely with the question of the plurality of the foot-and-mouth disease virus, and the authors' observations confirm the results obtained elsewhere. There are at least two types, A and O, which remain unchanged through numerous passages and can be distinguished from each other only by cross-immunity tests.

The authors find that the duration of immunity conferred by a natural attack averages about a year. On the whole the immunity conferred by virus O is longer than that conferred by A. In very exceptional cases it may not persist for more than a few weeks.

The authors appear to be inclined to support the idea of local immunity. The theory of plurality of the virus is not sufficient to explain all cases of relapse. In some cases repeated inoculations instead of producing hyperimmunity tend to produce increased susceptibility.

MAITLAND (H. B.), BURBURY (Y. M.), HARE (T.) & MAITLAND (M. C.). **Investigations on Foot-and-Mouth Disease by Means of Experiments with Small Animals during 1926-27.**—*Jl. Comp. Path. & Therap.* 1928. June. Vol. 41. No. 2. pp. 123–159.

This paper is divided into six sections dealing respectively with (1) Vaccine prepared from foot-and-mouth virus; (2) The methods of demonstrating immunity to foot-and-mouth disease; (3) The determination of the immunological types to which the different strains of virus belong; (4) The duration of infectivity of the tissues of guineapigs following infection by intradermal inoculation; (5) Experiments on the passage of foot-and-mouth disease in different species of animals; (6) Experiments on the localization of the lesions and on local immunity in foot-and-mouth disease.

It is impossible to abstract the mass of technical detail contained in these sections, and the general conclusions are therefore dealt with.

The work done in Section I leads the authors to conclude that in the preparation of a formalized vaccine the factors of temperature, time of contact with formalin and hydrogen ion concentration exert a marked influence on the quality of the vaccine. The best immunization has been obtained by using a vaccine prepared by killing the virus with 0·1 per cent. formalin at 26° C. for 48 hours, the pH being adjusted to 7·6.

Simple exposure of the virus to a temperature of 37° C. for 5 days at pH 7·6 produced a vaccine closely comparable to the above. Drying the virus at the same temperature rendered it valueless as a vaccine.

Sodium ricinoleate and crude castor oil soap destroy the virus.

Vaccines made by the formalin method from guineapig serum were superior to those prepared from vesicle fluid or epithelium.

When formalized normal guineapig serum or rabbit serum, casein, and plague vaccine were injected simultaneously with the vaccine, but into the opposite leg, the degree of immunity appeared to be higher than that produced by the vaccine alone.

The formalized vaccine retains its activity for several months at ±5° C. in the dark, but at room temperature marked deterioration occurs.

The immunity produced by the formalized vaccine is specific for the immunological type of virus. Unknown viruses can be typed by using them for the inoculation of guineapigs protected by formalized vaccines.

Section 2.—It is a matter of considerable importance to select a method for testing the immunity of guineapigs. Resistance in intramuscular inoculation represents an inferior grade of immunity than that which leads to a suppression of generalization following a primary lesion induced by intradermal inoculation. Complete immunity to intradermal inoculation represents a higher degree of immunity still, and this may be qualified by the number of minimal infective doses used in the test.

It is only the serum of animals possessing this high degree of immunity that can be shown by *in vitro* experiments to contain any antibodies. It is probable that they are present in the sera of other animals, but in amounts too small to be detected by present methods.

The immunity to foot-and-mouth disease can therefore be estimated quantitatively and the value of experiments depends upon the accuracy of the methods of estimation. Similarly, the strength of a virus can

be calibrated, so to speak, by the intradermal inoculation of guineapigs with successive dilutions.

The strength of an immune serum can be tested either by *in vitro* neutralization of virus or by passive immunization of guineapigs, but as the factor of susceptibility does not come into consideration in the former method, this is probably the more exact, and further both factors in the test can be measured with accuracy.

Guineapigs which have passed through an attack of the disease preserve their immunity to the same virus for months, but this immunity is relative to the amount of virus used in testing. In other words, by increasing the amount of virus in the test inoculation the resistance can be overcome.

A single dose of formalized vaccine will produce a degree of immunity which will protect against intramuscular inoculation and a higher degree of immunity which will prevent generalization after intradermal inoculation has produced a primary lesion.

Section 3.—Guineapigs can be used for the typing of viruses, and they are especially suitable because there is no risk of spontaneous cross-infection. It is important, however, that in comparing strains only viruses which have become adapted to guineapigs should be used. It has been the authors' experience that 8 to 13 passages from pad to pad are required to reach a fairly constant titre of 1 in 500,000 or more.

Strains of unknown type have been tested on guineapigs immune to the two types of virus found in this country. In preference to convalescent animals vaccinated guineapigs have been employed as this effects a saving in time.

Resistance to generalization after the development of a primary lesion has been taken to indicate immunity, and to identify therefore the strain being tested. Not less than eight guineapigs must be used for such a test, as it has been found that vaccine may not protect from 10 to 25 per cent. of the animals used in any test.

In England only strains recognizable as being identical with the strains O and A of Vallée have been encountered.

German authorities recognize three types which they refer to as A, B and C. Type C has not been encountered in England.

Section 4. The duration of the infectivity of tissues of guineapigs after intradermal inoculation.

Tissues were examined during life and after death. During life the heart blood, pad epidermis, saliva, and urine were tested. After death (killing by chloroform after withdrawal of heart blood) the heart blood, ear epidermis, epidermis of the abdomen, aqueous humour, eyeball, gastric juice and intestinal juice were tested. The results indicated that the epithelium from a pad lesion was infective up to the 5th day after infection, the epidermis of the ear up to the 10th day (at least) although no lesion of the ear could be detected. The gastric juice was not infective.

Section 5.—The passage of the virus in other species of animals.

Since the previous experiments, in which guineapigs, rabbits, wild and tame rats were used, were recorded, further tests have been carried on with these species, as it was thought that results might vary with different types of virus.

In the first set of experiments attempts were made to infect tame rats and rabbits with Type O virus direct from bovines, and similar experiments were carried out with Type A virus.

The third group of experiments in this section concerned the raising or lowering of virulence and possible change of type of virus by passage through animals of different susceptibility. It was found that neither the A nor the O type of virus was readily adapted to rats or rabbits, and these animals were very resistant to the O virus taken direct from a bovine.

No evidence of change of type could be obtained. It was noted that epithelium from rabbits is highly infective for guineapigs, and that their blood is very variable in its content of virus.

Vaccines prepared from rabbits protect guineapigs as well as those made from guineapigs.

In Section 6 the experiments were made to find the explanation of the localization of the lesions of foot-and-mouth disease. The survival and growth of the virus in muscle and the distribution of the virus in the internal organs were investigated, and attempts were made to obtain evidence of local immunity as distinct from general immunity. While it was not found possible to graft the covering of the pad on to other parts of the body, success was achieved when, by a plastic operation, the hairy skin of the leg was made to cover the area normally covered by the pad. This skin developed lesions when guineapigs were inoculated intradermally or intramuscularly.

It appeared to be possible that pressure played a part in the production of lesions, and support is lent to the view by the facts that lesions have been set up in unusual situations subjected to pressure. This was done by placing the animals in cages with wide wire flooring the meshes of which were large enough to allow the feet to pass through. This caused the animals to clutch the wires with their toes in walking and consequently to produce pressure. The result was the production of lesions on the toes.

Attempts have been made to produce lesions in other parts of the body by subjecting them to pressure, but satisfactory results have not been obtained as yet.

In guineapigs inoculated intramuscularly the virus could be detected in the muscle inoculated and not in the corresponding muscle of the other leg 18 to 20 hours later.

But it was found that in experiments in which inoculated muscle was ground up with sand a strong buffer solution had to be used because of the acidity produced in grinding up the muscle. In three cases muscle, both inoculated and uninoculated, contained virus in the same dilutions at 24 hours. The animals were bled out before the muscle was taken, and the authors say that it seems possible that the virus found was contained in residual blood. In experiments to test the distribution of the virus in the internal organs no regularity of occurrence was found. In different animals it was found in the trachea, lung, liver, spleen, kidney, but never in the heart muscle. The blood of all the animals was virulent and this may have accounted for the finding of the virus in the organs.

With a view to obtaining evidence as to whether a condition of local immunity as distinct from general immunity occurs, experiments were carried out in which guineapigs were vaccinated intramuscularly and then after a week intradermally on one pad. Three weeks later they were again inoculated intradermally on the pads, but on this occasion both feet were inoculated. The results indicated that the foot which was inoculated twice was less readily infected. It is suggested that

this may be due to specific local immunity or to changes resulting in the pad as the result of the original infection.

It was not found possible to demonstrate any substance antagonistic to the virus in pads whether they have been the seat of lesions or not. Further tests are being carried out using heterologous viruses for the two infective inoculations, as this should cut out the possibility of the resistance being due to specific immunity.

PUNTONI (V.). L'eliminazione del virus rabico per le vie digerenti e le lesioni gastro-enteriche nella rabbia. [**The Elimination of the Virus of Rabies by the Alimentary Tract and the Lesions of the Gastro-Intestinal Tract in Rabies.**]—*Ann. d'Igiene.* 1928. Jan. Vol. 38. No. 1. pp. 1–22.

Dogs affected with rabies present with considerable frequency symptoms of gastro-enteritis.

The mucous membrane of the duodenum and the proximal part of the ileum show congestion and not infrequently haemorrhages.

By isolating a loop of the intestine, by Thory-Vella's method, it can be shown that the virus is eliminated into the lumen of the bowel as it is by the saliva, and it is reasonable to attribute the lesions of the mucous membrane to the action of the virus. Similarly, the congestive phenomena seen in the mouth and throat are no doubt evidence of elimination of the virus.

KOLDAGEIV (B.). Ueber Glykämie bei experimenteller Wutkrankheit. [**Glycaemia in Experimental Rabies.**]—*Deut. Tierärzt. Wochensch.* 1928. June 2. Vol. 36. No. 22. pp. 384–385.

The author finds that glycaemia does not always occur in rabbits inoculated with fixed virus. It was found in about 50 per cent. of the animals on the last day of the disease.

BASSET (J.) & LABORDERIE. Rage chez un mulet. Observations sur le diagnostic expérimentale de la rage. [**Rabies in a Mule. Observations on the Experimental Diagnosis of Rabies.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. Feb. Vol. 80. pp. 76–85.

The mule was one recently imported from Syria. The earlier symptoms were not pronounced ; the animal pawed the ground, and frequently extended itself as if to urinate without doing so. These manifestations lasted about 10 minutes, and the were repeated at about half-hour intervals.

The following morning there was evidence of colic, and the symptoms appeared frequently throughout the day, becoming more marked towards evening. On the third day there was marked excitement and inco-ordination of movement. Periods of quietude were interspersed between the attacks, during which the animal could be examined without difficulty. The visible mucous membranes were very congested, the temperature 40° C. and the pulse 80. The lower jaw was paralysed and the mouth was held half open. There was paresis of the hind legs.

In a period of excitement the mule attempted to bite the man holding it, but could not close its mouth. The animal died when the paralysis had extended to the anterior limbs.

Paralysis of the jaw is not usual in equidae affected with rabies; in fact the authors suggest that it has not been recorded before. Only the bulb of the brain was examined and here perivascular infiltrations with rounded cells were found. These, however, are not special to rabies.

A rabbit inoculated with emulsion of the bulb showed symptoms of paralysis on the 22nd day, but these involved, not the hind, but the forelegs. The animal moved in a series of jumps, landing on its face or sternum each time. By the evening of the same day posterior paralysis was practically complete, and the animal died the following morning.

Two guineapigs were also inoculated intramuscularly into the thigh. The first symptoms of paralysis appeared in the inoculated leg of one of them on the 20th day. It affected the other hind leg within 24 hours later, and 30 hours after the appearance of symptoms paralysis of the hindquarters was complete, but sensation was not absent. By the fourth day paralysis had extended to the forelegs and neck.

The second guineapig failed to become infected. The authors recommend that guineapigs should be used in preference to rabbits for the diagnosis of rabies.

GALLI-VALERIO (B.). Symptômes rabiformes non rabique chez les carnassiers. [**Non-rabic Rabiform Symptoms in Carnivora.**]—*Schweiz. Arch. f. Tierheilk.* 1928. Feb. Vol. 70. No. 2. pp. 72–76.

Long experience convinces the author that in cases which have exhibited symptoms suspicious of rabies the whole carcase and not only the head should be sent to the laboratory. He is of the opinion that parasites, animal and vegetable, may be responsible for the production of such symptoms.

The author passes under review the diseases included in these groups. The nervous form of distemper may be characterized by violent excitement followed by symptoms of paralysis. A case is cited in which a dog showed symptoms of severe cerebral excitement, and at the post-mortem a flea was found in the brain.

Otacariasis may cause rabiform symptoms in dogs, cats, and foxes.

*Linguatula rhinaria* is given as a parasite which may be responsible for symptoms resembling those of rabies.

Ascarides are held responsible for the production of similar symptoms. The author states that heavy infestations in young animals may cause convulsions, and human beings may be bitten. *Eustrongylus visceralis*, *Filaria immitis*, and tapeworms are all held to be the cause of rabiform symptoms.

AYYANGAR (S. S.). **S.S. Inoculation for Rinderpest with Local Virus.**—*Indian Vet. Jl.* 1928. July. Vol. 5. No. 1. pp. 7–10.

The author records the use of virus from naturally infected animals for the serum simultaneous inoculation. Intravenous injection of tincture of iodine (15–20 cc. in 40 cc. of sterile water) was said to have reduced the temperature of infected animals, and to have assisted recovery.

DELPY (L.). Peste bovine atypique transmise par passages. Contribution à l'étude des porteurs de virus. [**Atypical Cattle Plague transmitted by Passage. The Question of Carriers of Virus.**]—*Rev. Gén. Méd. Vét.* 1928. May 15. Vol. 37. No. 437. pp. 259–264.

In the course of some experiments regarding the attenuation of the virus of cattle plague the virus became modified spontaneously and failed to produce typical rinderpest for several passages.

The condition was unlike any of the atypical forms described by other investigators save a single case described by BOYNTON in 1915.

At Bamako the virus is kept running in calves brought from areas which have been free from rinderpest for several years, and it produces in them, with a 1 cc. dose, the typical picture of the disease, viz., elevation of temperature on the fourth day, the appearance of lesions in the mouth between the 4th and 6th days, diarrhoea and death on the 10th to 12th day.

Starting with a calf which gave a typical reaction to inoculation, two calves were inoculated each with 1 cc. of blood which was taken when the temperature was at its maximum. One of these had a maximum temperature of only 40° C., with distinct buccal lesions, profuse diarrhoea, and death took place on the 8th day. The disease was therefore rapidly fatal but apyretic. The other calf, which was the subject of experiment and which was given a mixture of blood and tapioca, showed quite a different reaction. The temperature rose to 41·8° C. by the 5th day, and then fell rapidly. Death took place on the 8th day, when typical lesions were present in the mouth. To avoid loss of the virus a fresh calf was inoculated with 5 cc. of blood from each of these two animals.

This calf reacted atypically. The temperature rose to 40·5° C. on the fifth day and then fell slightly. It rose again to 40·8° C. on the 14th to 16th days and fresh rises occurred on the 23rd, 28th, and 44th days. Buccal lesions appeared on the 7th day and were present at the time of death. Repeated examinations of the blood failed to reveal the presence of either piroplasms or trypanosomes.

During the second rise of temperature 20 cc. of blood were taken for the inoculation of another calf. A slight rise of temperature occurred shortly after the inoculation and there were further rises on the 10th, 18th, 26th, 32nd, and 47th days. Buccal lesions appeared on the 10th day, and there was slight diarrhoea on the 12th day.

A similar form of the disease developed in four other calves inoculated.

It was thought that by chance an attenuated virus had been encountered, and two of the calves which survived for some weeks showing an occasional elevation of temperature were tested as to their immunity. One of these was given 10 cc. of blood containing new active virus recently obtained. It gave a distinct reaction, but the temperature gradually fell, profuse diarrhoea reappeared and death took place on the 9th day. The other was infected by contact. On the 8th day the temperature rose to 41·5° C. and death took place on the 12th day.

The atypical cattle plague therefore conferred no immunity against the typical disease. The question arises as to whether the animals were affected with a mild form of the disease or whether it was a very chronic form showing a slow course. The author thinks the latter view is correct, because, in the first place, the blood was virulent in the

atypical cases throughout the course of the disease, and secondly, because the disease terminated fatally in every instance.

The later members of the series of animals inoculated with this virus died earlier than the first few of the series.

PICARD (W. K.). **Pseudo-Fowlpest.**—*Dept. Agric., Indust., & Comm. Dutch East Indies. Vet. Bull. No. 65.*—46 pp. With 4 charts & 10 figs. on plates. Buitenzorg : Archipel Drukkerij.

Attention was first drawn to this disease in March, 1926, when very severe losses occurred among fowls in the neighbourhood of Batavia. Soon after this reports regarding its occurrence in other islands of the Archipelago were received.

The author describes the disease as being in all probability identical with the " Newcastle " disease described by DOYLE.

Picard obtained fowl plague virus from Utrecht for cross immunity tests.

The pseudo-pest virus is transmissible to fowls, native ducks, and pigeons. A small scale experiment with geese failed, but there is reason to think, from field observations, that the goose is susceptible.

Infection may take place by indirect infection, but the virus quickly loses virulence outside the body.

ARAGÃO (H. de B.). **Myxoma of Rabbits.**—*Mem. Inst. Oswaldo Cruz.* 1927. Vol. 20. No. 2. pp. 237–247. With 2 charts & 5 plates.

The author describes a contagious and fatal disease of rabbits which occurs in certain countries in South America. Reference was first made to the condition by SANARELLI in 1898, he having studied the disease in Monte Video.

The symptoms are as follows: Progressive bilateral blepharo-conjunctivitis accompanied or quickly followed by the development on various parts of the body, but mainly on the nose, ears, and extremities of small fairly tense tumours. These may increase in size, or remain about the size of a hazel nut. Swelling of the natural orifices. Death takes place in 8 to 15 days, and during the last stages dyspnoea with stertorous breathing, cyanosis, and coldness of the extremities.

At the post-mortem examination the tumours are found in the subcutaneous connective tissue. Sometimes they are discrete and at other times agglomerated into masses. On section they have a lardaceous appearance and are fairly vascular. A considerable amount of serous liquid drains away from the cut surface. There is marked congestion of the liver, and slight congestion of the spleen and kidneys. The bladder is always distended with clear albumen-free urine. The thoracic organs appear to be normal and there is no marked quantity of exudate in the chest cavity. The central nervous system appears normal. The disease is caused by a filterable virus, but it is held back by Chamberland and other fine grain filters. The virus, in cases of the disease, circulates in the blood and can be found there during the whole course of the disease, and it has the skin as a special predilection seat. The virus is transmissible after great dilution. It has been shown that a slight scratch with a platinum needle which has been stuck into a tumour will convey the disease.

The natural secretions are infective and contact is the normal mode of transmission. Experiment indicated, however, that fleas can

transmit the disease. The virus does not appear to be pathogenic for any species other than tame rabbits. By passage through rabbits it is possible to exalt the virulence of the virus so that it proves fatal in 5 days. This exalted virus does not provoke the formation of tumours and the disease becomes a "myxomatous septicaemia." By passage the virus will sometimes kill without the production of any evidence of oedema. At 8–10° C. the virus retains its vitality up to 3 months, and contaminations do not affect it adversely.

Dried virus keeps for a month at room temperature and for 3 months in vacuo or in hydrogen.

Incubation at 37° C. is fatal to the virus in 10 days.

The virus resists 3 per cent. carbolic acid, 2 per cent. sublimate, 5 per cent. "formaldehyde," 1 per cent. iodine and 0·2 per cent. permanganate solution for 6 hours.

Chloroform destroys the virus in 24 hours.

The author has found an organism similar to those of variola, molluscum, etc., and he calls it Strongyloplasma myxomae.

Attempts to cultivate the virus have failed, and it cannot be shown that the blood of recovered animals, which are very few in numbers, or of animals repeatedly injected with dead virus has any protective power. Recovered animals resist re-inoculation.

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## MYCOTIC DISEASES.

PLANTUREUX (E.). Essais de vaccination préventive contre la lymphangite épizootique. [**Protective Inoculation against Epizootic Lymphangitis.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. July. Vol. 80. pp. 382–384.

The difficulty of controlling epizootic lymphangitis in any large number of horses is well known.

NAINSOUTA'S suggestion that the disease can be dealt with by intravenous injections of biniodide of mercury presents practical difficulties, and as a protective can have only a very transitory effect against a disease which, as a rule, has a long period of incubation and is caused by a very resistant organism.

Plantureux tested the value of the drug per os giving 0·2 g. weekly for six weeks. It was without effect.

He then tested Boquet and Nègre's anticryptococcic vaccine (formalized) giving first a dose of 2 cc. and three weeks later 3 cc. Ninety mules (one-third of the total number) were inoculated. One mule was admitted to hospital three days after the first dose and another twelve days after the second. During the succeeding period of thirteen months no case occurred among the inoculated animals, while six cases occurred among untreated animals.

The author thinks these results worthy of record, but he adds a word of warning regarding the possibilities of happy coincidence.

The plan is being tested out in another unit in the army.

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## MISCELLANEOUS.

EDWARDS (J. T.). **The Acclimatization of Imported Stock.**—*Agric. Jl. India.* 1927. Sept. Vol. 22. No. 5. pp. 333–338. With 1 plate; and part 6. pp. 411–424.

Acclimatization is concerned with the characteristics relating to climate and soil, and, largely through the interaction of these two factors, the local resources of fodder supply.

The author believes that the main factor in connexion with acclimatization of imported cattle in India is parasitism. He points out that the diseases which are indigenous to India are for the most part capable of being controlled by intervention of man, when they make their appearance in imported animals, but that the propagation of western methods of domestication among imported and cross-bred animals leads to the appearance of those diseases which cause such enormous losses in Europe and other temperate countries.

The most important parasites concerned with acclimatization are the piroplasms. The author gives a brief account of Babesia and Theileria.

He states that steps are being taken to overcome the difficulty of transmitting these parasites while inoculating against rinderpest by means of the simultaneous method, by using rinderpest virus passed into goats which do not harbour the intracorpuscular parasites of cattle.

GUDSCHEFF. Die ansteckende Pleuropneumonie der Ziegen. [**Contagious Pleuropneumonia of the Goat.**]—*Therapeutische Monatshefte f. Veterinärmedizin.* 1928. Mar. Vol. 1. No. 9. pp. 324–327.

This brief paper deals rather with the treatment of this disease by means of salvarsan than with the disease itself. The author finds this drug very valuable, as of 746 animals treated 88·4 per cent. recovered and 11·6 per cent. died. The doses range from 0·2 g. for animals weighing from 8–15 kilogs, to 0·7 g. for animals weighing from 55 to 70 kilogs.

MARSH (C. Dwight), CLAWSON (A. B.) & ROE (G. C.). **Coyotillo** (*Karwinskia humboldtiana*) **as a Poisonous Plant.**—*United States Dept. Agric. Technical Bull. No. 29.* 1928. Feb. pp. 1–26. With 17 figs.

The plant occurs in south-west Texas and in Mexico, and has been reported as causing paralysis.

Experiments have shown that it affects cattle, sheep, goats, and chickens, and it can also produce symptoms in guineapigs. There is also evidence to show that horses and pigs may be poisoned by the plant.

The poisonous nature of the plant appears to have been known for over a century, as also the fact that an interval elapses between the ingestion of the plant and the development of symptoms. Further, it was thought that the seeds of the berry borne by the plant were the toxic portion of it.

In experimentally produced cases inco-ordination and dragging of the hind legs was first seen. In more pronounced cases a high-steppng action is observed. Control of the limbs is entirely disorganized and animals may go backwards instead of forwards, or may progress by a series of jumps. It may progress until the weakness is so great that complete collapse occurs. There seems to be no pain, and the appetite is maintained. Temperature, pulse, and respiration remain normal.

Experiments with leaves showed that these were also able to produce symptoms and death.

In chickens fed with the fruit the symptoms were in general similar to those produced in cattle and sheep, but sometimes the birds walked with a peculiar stilted action. The lesions found at post-mortem examination are very indefinite, but generally speaking the mucous membrane of the alimentary canal shows congestion.

Microscopically the principal change was found in the liver, where there was a condition of necrosis of the liver cells around the central vein. The kidneys showed a moderate degree of acute parenchymatous degeneration.

The lymphatic glands throughout the body were congested.

Since in many animals the symptoms do not make their appearance for some time after the plant has been ingested, and the illness produced is sometimes prolonged, exact information regarding the lethal doses is not available.

For sheep the minimum toxic dose is 0·15 per cent. of the animal's weight. For cattle the minimum toxic dose appears to be about 0·05 per cent. body-weight and the minimum lethal dose about three times this.

For goats the toxic dose appears to be a little larger than that for sheep.

For chickens the toxic and lethal doses are very close together, and about 0·3 per cent. body-weight may produce fatal poisoning.

In the experiments carried out the interval between feeding and the onset of symptoms ranged from two days to seven weeks. When symptoms occur they develop suddenly as a rule.

Prognosis is distinctly bad, and the data obtained so far give no indication that any treatment is of value.

LEVADITI (C.) with SCHOEN (R.) & SANCHIS-BAYARRI (V.). Le virus syphilitique comporte-t-il un cycle évolutif dont le *Treponema pallidum* n'est qu'une des phases connues? [**Has the Virus of Syphilis a Cycle of Development of which** *Treponema pallidum* **is the only one Phase which is known?**]—*Ann. Inst. Pasteur.* 1928. May. Vol. 42. No. 5. pp. 475–494. With 5 text figs.

In this paper the authors give an account of their work carried out during the past two years, and although they do not claim to have provided a complete solution to the question, they feel that progress has been made.

The authors agree with other investigators that the disease can be transmitted by inoculation with gland material which cannot be shown to contain the treponema.

When tissue containing the spirochaete is grafted the invasion of the tissues involved by the parasite can readily be followed, but when gland substance in which no treponema can be found is used there is a

phase lasting on an average some 45 days before spirochaetes can be detected. At this stage giant cells can be found, particularly at the periphery of the lesion.

The spirochaetes however can be divided into two types: one in which the organisms have retained their characteristic morphology and the other in which changes both in morphology and staining reactions are recognizable. Changes in the shape of the spirals, swellings along the length of the organisms, rings which may be completely closed or not, comma-shapes, and granules of various sizes are the principal abnormalities noted. The authors believe that these form a definite succession of alterations terminating in the production of almost ultramicroscopic granules.

The authors have not been able to obtain any evidence that the virus even in what they consider its granule form is filterable.

PANISSET (M.). Aperçu sur le système réticulo-endothélial. Constitution histologique. Rôle dans la défense de l'organisme. [**The Reticulo-Endothelial System.**]—*Rev. Gén. Méd. Vét.* 1928. July 15. Vol. 37. No. 439. pp. 364–368.

The reticulo-endothelial system comprises the endothelial cells of the spleen, the lymphatic glands, the bone marrow, the supra-renal medulla, and the venous capillaries of the liver. It also includes the clasmatocytes of the connective tissue. All these cells possess prolongations of a special character, and these form a kind of network in which the tissue cells of the parenchyma are embedded.

Apart from histology, the reticulo-endothelial system is characterized by certain biological characters. The distribution of the system may be demonstrated by injecting rabbits with lithium carmine.

All investigators agree that the system plays an important part in the defence of the animal against infections.

The intravenous injection of rabbits with colloidal solutions of silver or with chinese ink causes the cells of the system to become packed with granules. The same holds good for certain bacteria. If a pigeon be inoculated with the bacillus of swine erysipelas the cells of the reticulo-endothelial system are found crammed with the organisms, while they cannot be demonstrated in the parenchyma of the organs. Similar results may be obtained with Hansen's bacillus, the tubercle bacillus, and the anthrax bacillus.

In blood transfusion in the dog the transfused cells are collected in the endothelial cells.

The presence of these substances (chemical, microbial, etc.) within the cells of the system is evidence that their inclusion is the result of action on the part of the cells. They are, in fact, fixed phagocytes. Some view the cells of the reticulo-endothelial system as the forerunners of the leucocytes.

The conception of a reticulo-endothelial system affords an explanation of the benign results of splenectomy, other tissues of the system forming "spleen substitutes."

Endothelial cells are defensive not only against bacteria, but also against their toxins. Profound changes may occur in the vascular endothelium. If suspensions of fine particles such as chinese ink or trypanblue be injected intravenously the endothelial cells become charged with granules, and from a functional point of view they cease to exist. There is a condition of so-called "blockage." Blockage, with or without splenectomy, makes the production of active immunity

impossible, and, similarly, it prevents the formation of agglutinins and precipitins.

In connection with the part played by the reticulo-endothelial system in the production of antibodies mention must be made of numerous cases in which blockage alone is not sufficient, removal of the spleen is also essential.

It is known that certain poisons can produce inflammatory reactions in the reticulo-endothelial system. Pernicious anaemia in man and delay in coagulation of the blood are possibly attributable to defects in the system.

Certain French investigators do not agree with the views held by German and American authors regarding the functions of the reticulo-endothelial system. They point out that the phenomena of blockage quickly disappear before the disappearance of the inhibitory impregnation of the cells, and before supplementary tissues can come into existence.

SERGENT (Edm.), PARROT (L.), DONATIEN (A.) & LESTOQUARD (F.). L'état de prémunition et la vaccination prémunitive. [**The State of Premunition and Premunizing Vaccination.**]—*Arch. Inst. Pasteur d'Algérie.* 1927. Dec. Vol. 5. No. 4. pp. 469–474.

From the point of view of immunity diseases can be divided into two groups, namely, those an attack of which confers complete immunity with disappearance of the infecting organism and those in which a condition of equilibrium is established between the organism and the defences of the body, and the condition of resistance is associated with a persistence of infection.

The authors therefore distinguish between the two states and they use the terms premunized and premunizing vaccination to designate the latter condition.

LHEZ (B.). Le diagnostic différentiel des maladies rouges du porc. [**The Differential Diagnosis of the "Red Diseases" of the Pig.**]—*Arch. Inst. Pasteur d'Algérie.* 1927. Dec. Vol. 5. No. 4. pp. 538–566. With 4 figs. on 2 plates.

In all pig-breeding countries the contagious diseases called "red diseases" (maladies rouges) of the pig form a serious obstacle to progress. Differential diagnosis must be accurate if progress is to be made against these diseases. This, however, is far from being a simple matter, and the object of the paper is to bring into prominence the important points that have been gathered from the investigations of a number of research workers in various parts of the world.

With regard to swine erysipelas there is not much difficulty, but the symptoms are not always typical. In the acute forms the reddening of the skin in patches is pretty characteristic. In the chronic forms hurried respiration without cough, cutaneous necrosis, and arthritis are prominent features. At the post-mortem examination congestive inflammation with enlargement of the spleen are rather typical. In these cases microscopic examination is sufficient to settle the question.

In the case of swine fever the matter is not so simple. The epizootic character of the disease is the important point. Complications frequently supervene on swine fever, and these assist in diagnosis.

In acute swine fever the inflammation is of the haemorrhagic type. When a single animal is affected laboratory assistance must be sought to prove the existence of the filterable virus.

In the case of contagious pneumonia the enzootic character of the disease is of importance because the disease is less contagious than swine fever.

GUPTA (M. C.). **Brief Notes on Diseases Common amongst the Working Elephants in Burma.**—*Indian. Vet. Jl.* 1928. July. Vol. 5. No. 1. pp. 17–28.

Under the heading " Worms," the author states that he has seen the heart and lungs attacked by bots, and that the organs were " perforated " as a result.

The author has had " no practical experience of surra," but states that the " method of infection is by ingestion, usually from the bites of arthropods (generally blood-sucking flies) which is the intermediate host of the flagellate form."

" Intra-rectal injection " of neo-salvarsan " should have good results " in the acute form of the disease.

" In the chronic form one ounce of Liqr. arsenicalis daily with Gupta's Tonic Powder and Epsom salt should be given."

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